

We claim:

1. A pattern inspection method of judging a part as a defect candidate, in which a mismatch is found by a comparison between the same patterns, comprising: a  
5 differential image being generated by calculating the difference, including the polarities, between two patterns to be compared; the absolute value of the differential image being compared with a first threshold value and the part where the first threshold value is exceeded being detected as a defect candidate; and the  
10 polarities of the differential image of the part of the defect candidate being inspected and the part of one of the polarities being judged a defect candidate.

2. A pattern inspection method as set forth in  
15 claim 1, wherein the absolute value of the differential image of the part of the defect candidate of the other polarity is compared with a second threshold value, which is greater than the first threshold value, and when the second threshold value is exceeded, the part is included  
20 among the final defect candidates.

3. A pattern inspection method as set forth in  
claim 1, wherein two of the differential images are generated with respect to two different patterns and the part, at which two parts where the absolute values of the  
25 two differential images are greater than the first threshold value overlap each other, is judged to be a defect candidate.

4. A pattern inspection method as set forth in  
claim 3, wherein a third differential image is further  
30 generated between the part of the defect candidate and a third pattern other than the two different patterns and the part is left as a defect candidate when the absolute value of the third differential image is greater than a third threshold value and left out of the defects  
35 candidate when less.

5. A pattern inspection method as set forth in  
claim 4, wherein a fourth differential image is still

5 further generated between the part of the defect candidate and a fourth pattern other than the three differential patterns and the part is left as a defect candidate when the absolute value of the fourth differential image is greater than a fourth threshold value and left out of the defect candidates when less.

6. A pattern inspection method comprising an image generation step in which a multivalued image of plural pattern units having the same pattern is generated, a 10 defect candidate detection step in which the two pattern units are compared and the part at which a mismatch is found is detected as a defect candidate, and an analysis step in which the defect candidate is analyzed, wherein, a 15 differential image is generated by calculating the difference, including the polarity, of the two pattern units to be compared in the defect candidate detection step; the absolute value of the differential image is compared with a first threshold value and the part where the first threshold value is exceeded is detected as a 20 first defect candidate; and the polarities of the differential image of the part of the first defect candidate are inspected and the part of one of the polarities is detected as a defect candidate.

7. A pattern inspection method as set forth in 25 claim 6, wherein the absolute value of the differential image of the part of the first defect candidate of the other polarity is compared with a second threshold value, which is greater than the first threshold value, and when the second threshold value is exceeded, the part is 30 included among the defect candidates.

8. A pattern inspection method as set forth in 35 claim 6, wherein two of the differential images are generated with respect to two different pattern units and the part, at which two parts where the absolute values of the two differential images are greater than the first threshold value overlap each other, is judged as a first defect candidate.

9. A pattern inspection method as set forth in  
claim 8, wherein a third differential image is further  
generated between the defect candidate and a third  
pattern unit other than the two pattern units and left as  
5 a defect candidate when the absolute value of the third  
differential image is greater than a third threshold  
value and left out of the defect candidates, when less,  
in the defect candidate detection step.

10. A pattern inspection method as set forth in  
claim 9, wherein a fourth differential image is still  
further generated between the defect candidate and a  
fourth pattern unit other than the three different  
pattern units and left as a defect candidate when the  
absolute value of the fourth differential image is  
15 greater than a fourth threshold value and left out of the  
defect candidates, when less, in the defect candidate  
detection step.

11. A pattern inspection method as set forth in  
claim 6, wherein: the plural pattern units are arranged  
20 at fixed pitches; multivalued images are generated  
sequentially by relatively moving a one-dimensional image  
pickup device in the arrangement direction with respect  
to the plural pattern units in the image generation step;  
and the generation of the differential image, the  
25 detection of the first defect candidate, and the  
detection of the part of one of the polarities as a  
defect candidate in the defect candidate detection step  
are performed successively by the pipeline data process.

12. A pattern inspection method as set forth in  
30 claim 11, wherein the differential image is generated  
sequentially between two adjacent pattern units in the  
relative movement direction and in the detection of the  
first defect candidate, the part, at which two parts  
35 where the differential images between each pattern unit  
and two adjacent pattern units on both sides are greater  
than the first threshold value overlap each other, is  
judged as the first defect candidate.

13. A pattern inspection apparatus that judges a part as a defect candidate, at which a mismatch is found by a comparison between the same patterns, comprising: an image generation device that generates a multivalued 5 image of the pattern; a differential image generation circuit that generates the differential image by calculating the difference, including the polarities, of the two patterns to be compared; a first comparison circuit that compares the absolute value of the 10 differential image with a first threshold value and detects the part as a defect candidate, where the first threshold value is exceeded; and a defect polarity judgment circuit that inspects the polarities of the differential image of the part of the defect candidate 15 and judges the part of one of the polarities as a defect candidate.

14. A pattern inspection apparatus as set forth in claim 13, wherein a second comparison circuit is further provided, which compares the absolute value of the 20 differential image of the part of the defect candidate of the other polarity with a second threshold value that is greater than the first threshold value, and the part is included among the defect candidates when the second threshold value is exceeded.

25 15. A pattern inspection apparatus as set forth in claim 13, wherein, the differential image generation circuit generates two differential images with respect to two different patterns and the first comparison circuit judges the part, at which two parts where the absolute 30 values of the two differential images are greater than the first threshold value overlap each other, as a defect candidate.

35 16. A pattern inspection apparatus as set forth in claim 15, further comprising: a first defect differential image generation circuit that further generates a third differential image between the part of the defect candidate and a third pattern other than the two

different patterns; and a third comparison circuit that leaves the part as a defect candidate when the absolute value of the third differential image is greater than a third threshold value and leaves out of the defect candidates, when less.

5           17. A pattern inspection apparatus as set forth in claim 16, further comprising: a second defect differential image generation circuit that further generates a fourth differential image between the part of 10 the defect candidate and a fourth pattern other than the three different patterns; and a fourth comparison circuit that leaves the defect candidate as a final defect candidate when the absolute value of the fourth differential image is greater than a fourth threshold 15 value and leaves out of the defect candidate, when less.

18. A pattern inspection apparatus, comprising: an image generation section that generates a multivalued image of plural pattern units having the same pattern, a defect candidate detection section that compares the two pattern units and detects a part at which a mismatch is found as a defect candidate, and an analysis section that analyzes the defect candidate, wherein the defect candidate detection section comprises: a differential image generation circuit that generates a differential image by calculating the difference, including polarities thereof, between the two pattern units to be compared; a first comparison circuit that compares the absolute value of the differential image with a first threshold value and detects a part where the first threshold value is exceeded as a first defect candidate; and a defect polarity judgment circuit that inspects the polarities of the differential image of the part of the first defect candidate and detects the part of one of the polarities as a defect candidate.

35           19. A pattern inspection apparatus as set forth in claim 18, wherein the defect candidate detection section comprises a second comparison circuit, which compares the

absolute value of the differential image of the part of the first defect candidate of the other polarity with a second threshold value that is greater than the first threshold value, and includes the part among the defect candidates when the second threshold value is exceeded.

20. A pattern inspection apparatus as set forth in claim 18, wherein the differential image generation circuit generates two differential images with respect to two different pattern units and the first comparison circuit judges a part, at which two parts where the absolute values of the two differential images are greater than the first threshold value overlap each other, as a defect candidate.

21. A pattern inspection apparatus as set forth in claim 20, wherein the defect candidate detection section further comprises a third comparison circuit that generates a third differential image between the part of the defect candidate and a third pattern unit other than the two different pattern units and leaves the part as a defect candidate when the absolute value of the third differential image is greater than a third threshold value and leaves out of the defect candidates, when less.

22. A pattern inspection apparatus as set forth in claim 21, wherein the defect candidate detection section further comprises a fourth comparison circuit that generates a fourth differential image between the part of the defect candidate and a fourth pattern unit other than the three different pattern units and leaves the part as a defect candidate when the absolute value of the fourth differential image is greater than a fourth threshold value and leaves out of the defect candidates, when less.

23. A pattern inspection apparatus as set forth in claim 18, wherein: the plural pattern units are arranged at fixed pitches; the image generation section sequentially generates multivalued images while relatively moving a one-dimensional image pickup device in the direction of the arrangement with respect to the

plural pattern units; the defect candidate detection section comprises a memory and a pipeline data processing processor; and the differential image generation circuit, the first comparison circuit, and the defect candidate 5 polarity judgment circuit are composed of the memory and the pipeline data processing processor.

24. A pattern inspection apparatus as set forth in claim 23, wherein the differential image generation circuit sequentially generates the differential images 10 between two pattern units adjacent in the direction of the relative movement and the first comparison circuit judges a part, at which two parts where the differential images between each pattern unit and two pattern units adjacent on both sides exceed the first threshold value 15 overlap each other, as the first defect candidate.